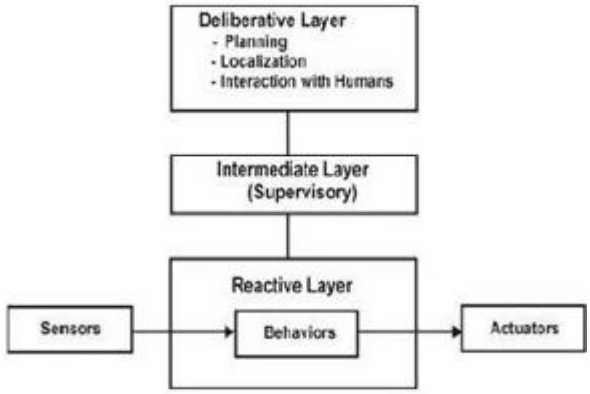

Figure 5: The three level architecture for robot control
Source: www.google.com

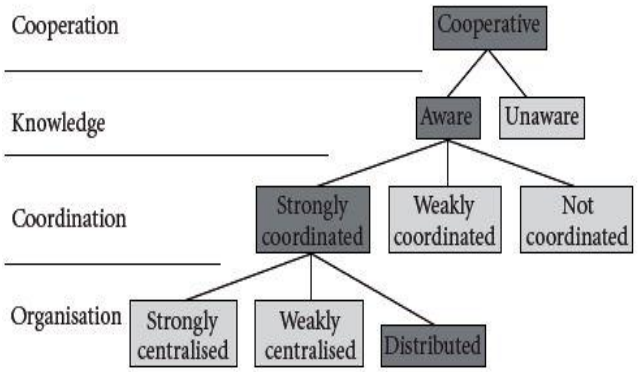

Figure 6: Taxonomy for a Swarm-robotics system.
Source: Hindawi Publishing Corporation ISRN Robotics Volume 2013, Article ID 608164, 10 pages
http://dx.doi.org/10.5402/2013/608164

Applications

Swarm robots can perform tasks in which the main goal is to cover a wide region. The robots can disperse and perform monitoring tasks, for example, in forests, lakes, and so forth. It can be really useful for detecting hazardous events, like a leakage of a chemical substance. The main advantage over a sensor network is that the swarm can move and focus on the problem and even act to prevent the consequences of that problem. In this way swarms of robots can be really useful for dangerous tasks. For example, for mining detection and cleaning. It can be more useful than a unique specialised robot, mainly because of the robustness of the swarm: if one robot fails and the mine explodes, the rest of the swarm continues working. In the case of a single robot this is not possible. The number of possible applications is really promising, but still the technology must be developed both in the algorithmic and modelling part, and also in the miniaturisation technologies. To reduce downtime in machinery, a robotic swarm can be used. Today much machinery needs manual inspection especially if the equipment is related to human safety. Downtime due to manual inspection can be lowered using a swarm of robots working in parallel, reaching machinery that would require cameras. Remote equipment could be reached by means of a swarm. An example of this could be power line inspection where a long distance of cable needs close and visual inspection. A swarm could travel along the power lines checking them for damage. If damage is found a larger separate robot could be sent for repairs. This would speed up the inspection process, increase efficiency and lower cost. When searching for something it often requires covering large surfaces. Whether it is under water, from the air or on the ground, more units searching imply faster cover-age due to its scalability. Here the use of robots can lower cost by replacing manned search. Were robots search with a range of sensors beyond human capabilities. This would implicate in the event that the desirable object or objects are humans that lives could be saved. These swarms could also be used in hazardous environments that are unsuitable for human interaction. Several robots also have the capability to transport objects as a group giving support one robot could not achieve. In surveillance of buildings and larger aerials, swarms give better coverage, fault tolerance and navigation than single robotic surveillance. In addition a swarm, compared to human surveillance gives lower costs.

5. Limitations

Swarm robotics design is more costly as the sensors, cameras, motors and other parts that make the robot work are all expensive. This also suffers from poor communication and there is lack of coordinated algorithm and applications.

6. Conclusion

Robotic swarm can be used in an assignment that has high cost and is difficult to perform for humans. If the assignment requires a need for scalability and fault-tolerance the gain is even higher. **S**warm robot design, technology and applications are developed, enhanced and growing day by day. Swarm robots may one day be deployed by the thousands to monitor and sense the environment, inspect machinery and even perform medical procedures inside human body. Implicit communication seems to give more robustness in the communication architecture of swarm robotics. Distributed control architecture was preferred compared to centralized architecture to prevent single point failures

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